DOCUMENT RESUME

ED 338 377 PS 019 946

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TITLE Infant's Attention to Objects and Consistency in Linguistic and Non-Linguistic Contexts.
PUB DATE Apr 91
NOTE 13p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Seattle, WA, April 18-20, 1991).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Differences; Associative Learning; *Attention; *Cognitive Development; *Developmental Stages; *Infants; *Language Acquisition
IDENTIFIERS *Labeling (of Objects)

ABSTRACT

Two studies tested the observation that infants learn to use a "whole object assumption" between the ages of 8 and 15 months, meaning that they expect a word to apply to the whole object to which it refers. The first study investigated the possibility that infants of 8 to 10 months may attend differently, and more selectively, to events that are named than to events that are not. The study also considered what exactly the infants' attention is drawn to. A habituation procedure, in which infants watched a researcher manipulating objects on a stage and a speaker spoke behind the stage, was used. In a 2 x 2 design, half the infants heard the object being labeled and half did not. Half also saw a consistent object undergoing three different motions as opposed to different objects undergoing the same motion. For both motion and objects, infants attended more to what was consistent than to what was not. A second study sought to determine whether this tendency was stronger in infants who were learning language at 13 to 15 months. It was found that the older infants looked longer at a novel object regardless of whether it was in the consistent motion or the consistent object condition, and regardless of whether it was labeled or unlabeled. Five references and six charts are appended. (SAK)

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Infant's Attention to Objects and Consistency in Linguistic and Non-linguistic Contexts

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PS 019946

Paper presented at the Biennial Meeting of the Society for Research in Child Development, Seattle, WA, April, 1991.

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Infant's Attention to Objects and Consistency in Linguistic and Non-linguistic Contexts

I will talk today about some changes which appear to take place between the ages of 8 and 15 months in the way in which infants attend to labeled events. These observations may be of interest for understanding the very beginnings of language acquisition and, in particular, how it is that infants first begin to associate particular words to appropriate objects.

As most of you know, the task of identifying associations between words and referents is by no means straight-forward. In any given situation, there are a potentially infinite number of potential referents for a word. Thus, for example, if an adult says, "that's a birdie," the word *birdie* could, from an objective perspective, correspond to any of a number of different aspects of the situation. It could, for example, refer to a color like blue, a part such as the beak, a motion such as flying or a noise like chirping, as well as the intended referent.

To help to account for children's remarkable success at associating words to objects, Markman has proposed a *whole object assumption* (e.g., Markman, 1989): Young children will tend to expect that a word refers to a whole object, as opposed to a part or property of the object. Such a tendency would be extremely useful to the child, as it would help to narrow the possibilities for what a word could correspond to. The whole object assumption would at least give the child somewhere to start, even if it did not work in every case. Moreover, this notion fits nicely with the frequently reported predominance of object names in early speech (e.g., Gentner, 1982).

If the whole object assumption is to assist with language learning, then it (or something like it) should be present during the earliest phases of language learning, and maybe even before the child begins to talk. By looking at changes in infants' attention to labeled events between the ages of 8 and 15 months it may be possible to obtain evidence of an emerging whole object assumption. During those months, the infant goes from being effectively prelinguistic to having some command of language: An 8 month old infant is rarely producing any words and typically comprehends only a small number of words. In contrast, a 15-month old infant has frequently begun to produce some words and, even if not yet producing words, will generally understand a good many words. Thus, this period of development might be described as the period during which the infant "breaks into" language learning. Accordingly, we might expect to observe interesting changes in the way in which infants attend to labeled events during this period.

This period of development is also of particular interest because it may be informative as to the developmental origin of a whole object assumption. It seems a little dissatisfying to suggest that the child comes into the world with an expectation that words correspond to whole objects. But if children do not start out with this expectation, then where would something like a whole object assumption come from?

One possibility is that the whole object assumption may derive from early perceptual or attentional tendencies. In particular, it may develop from a tendency to attend to objects when they are labeled. Indeed, Baldwin and Markman (1989) have described just such a tendency with 10-14 month old infants: Young infants looked at an object which had previously been labeled and also touched it more than an object which had not been labeled.

It seemed possible, therefore, that there may be something about hearing an event named that would help to draw infants' attention toward objects. Note that with these young infants it would most likely be the intonation, not the particular words, which would be responsible for this focussing of attention. The point is, though, that there may be something about speech which is focussing attention.

The first question, then, is whether infants may attend differently, and more selectively, when events are named as opposed to when they are not. A second question concerns exactly what it is that infants' attention may be drawn toward. If increased attention in the presence of labeling is a precursor to a whole object assumption, then we might expect that labeling would increase attention to the whole object and direct attention away from parts or properties of the object. As I mentioned, that would fit nicely with the observation that early speech contains a great many object names.

On the other hand, although many early words are object names, by no means all are. Children produce, quite early, words like *uh-oh*, *more*, and *up*. Thus, it seemed that there might be at least one other possibility for what labeling could direct attention toward: Labeling could direct the child's attention toward an element that is consistent across events which are labeled (and it may simply turn out that whole objects are frequently an element that is consistent).

In an earlier study with 8-10 month olds (Echols, 1990), I found tentative support for the latter view. When infants heard an event labeled, they seemed to be more focussed on an aspect of the event that was consistent across repetitions of the event than they were when labeling was absent. Because the design will be very similar for the study with 13-15 month olds, I will describe it now.

I used an habituation procedure to determine whether infants may attend differently in the presence of labeling as opposed to in its absence, and to determine exactly *how* infants' attention may be focussed in the presence of labeling.

The habituation set-up is shown in Transparency 1. The infant was seated on a parent's lap, facing a small stage. A researcher was concealed behind the stage to manipulate the objects (which were colorful wooden or felt objects designed to be interesting and unfamiliar to young infants). A second researcher was concealed behind a one-way mirror to record the infant's looking behavior. For the presentation of speech stimuli, a speaker was concealed behind the stage. The session was videotaped to permit the calculation of reliabilities on infant looking times.

The design is shown in schematic form in Transparency 2. It was a 2 X 2 design in which half of the infants were assigned to a *labeled* and half to an *unlabeled* condition and in which half were assigned to a *consistent object* and half to a *consistent motion* condition. For infants in the labeled condition, the speech stimuli were nonsense-word labels embedded in a real-word frame, resulting in sentences like, "that's a *danu*."

Infants in the consistent object condition saw a single object undergoing three different motions, while those in the consistent motion condition saw three different objects all undergoing the same motion. These trials were repeated until the infant had habituated (as measured by a 50% decrement in looking time) or until nine trials had elapsed. Following the habituation trials, infants saw two types of test trials: (a) a novel object paired with a familiar motion, and (b) a familiar object paired with a novel motion.

The predictions are as follows: If labeling increases attention specifically to objects, then infants in both conditions who hear labeling should, during habituation, be focussing on the objects--either one or three objects depending on the condition--and attending less to the motion than infants who do not hear labeling. At test then, those infants should be more interested in the novel object relative to infants who hear no labeling and less interested in the novel motion.

On the other hand, if labeling draws attention to consistency, then the pattern will differ for infants in the consistent motion condition. Infants in that condition who hear labeling should pay more attention to the motion, because that's what's consistent. As a result, those infants should look longer at the novel motion during the test trials than infants who hear no labeling.

The data are reported in the form of proportion looking to the novel object, that is, the amount of time that the infant looks at the novel object divided by the total amount of time spent looking at the novel object and the novel motion. Proportions are used because infants vary greatly in their overall looking times. The predictions, in terms of proportion looking to the novel object, are shown in Transparency 3. They are as follows: If labeling increases attention to objects, then the proportion looking to the novel object should increase for infants in both conditions. If, however, labeling increases attention to consistency, then proportion looking to the novel object should still increase for infants in the consistent object condition, but should decrease for infants in the consistent motion condition (reflecting an increase in looking to the novel motion).

This latter pattern of results is what I found with the 8-10 month olds (see Transparency 4). Whereas infants in the consistent object condition showed a slight (but non-significant) increase in looking to the novel object, infants in the consistent motion condition showed a significant decrease in looking to the novel object or, in other words, a relative increase in looking to the novel motion.

Although there are some other explanations that I don't have time to get into, those results provide tentative evidence that these younger babies may be attending to consistency in the presence of labeling. In any case, the results are clear evidence that infants are attending differently when events are labeled as opposed to when they are not.

What about 13-15 month olds? As I mentioned, between about 8 and 15 months, infants undergo a transistion from being effectively prelinguistic to what we might want to call a newly linguistic infant--the 13-15 month old infant is starting to get the idea of what language is all about.

Moreover, this is shortly before the period when children's productive vocabulary typically undergoes a rapid expansion--the often reported vocabulary spurt. A high proportion of the new words produced during that vocabulary spurt, which generally occurs somewhere around 18 months, are object names (Nelson, 1973).

Given that comprehension typically precedes production by several months, it seemed likely that a similar vocabulary spurt in comprehension may occur sometime between 13-15 months. Accordingly, at least two different kinds of changes might be expected, between the ages of 10 and 13 months, in the way in which infants attend to labeled events.

First, it may be that whatever was happening at 8-10 months would get stronger. Thus, if the younger infants were attending to consistency, then the 13-15 month olds might become even more selectively focussed on the element that is consistent across events that are labeled.

Alternatively, it could be that the manner in which infants attend to events changes, in a way which is related to the linguistic transition that is occuring between those ages. Thus, it may be that a strong tendency to focus on objects in the presence of labeling would come into play around 13-15 months. (This change may even come about because the infant has noticed that whole objects are frequently the element of an event that is consistent across repetitions of a label.) This new tendency may then contribute to the rapid growth in vocabulary that is just ahead.

To investigate this possibilty, I made use of a variant of the habituation procedure which had been used with the 8-10 month-olds. Because 13-15 month olds are much more mobile than 8-10 month olds and, accordingly, less willing to sit for very long on their parents' lap, it was necessary to shorten the procedure. Thus, I used a familiarization procedure, in which infants saw only four trials before going on to the test trials. Aside from that change, the procedure and the design were effectively the same as for the younger infants.

The predictions are shown in Transparency 5. In terms of proportion looking to the novel object, and contrasting the labeled conditions with the unlabeled conditions, the predictions are as follows: If older infants show the same pattern as the younger infants but stronger, then the 13-15 month-olds should show a greater increase in proportion looking to the novel object if they are in the consistent object condition, relative to infants who hear no labeling. More importantly, they should also show a greater decrease in looking to the novel object if they are in the consistent motion condition than do the younger infants. In contrast, if a strong tendency to attend to objects in the presence of labeling develops during this period, then these older infants should show an increase in looking to the novel object regardless of whether they are in the consistent motion or consistent object condition.

In the study with 13-15 month-old infants, this second pattern was found. When compared to infants who heard no labeling, these older infants looked longer at the novel object regardless of whether they were in the consistent object or consistent motion condition (see Transparency 6).

There are several possible explanations for this observation. The first and least interesting is that it is simply due to the change in methodology between the study with 8-10 month olds and the study with the older infants (i.e., the use of a familiarization procedure instead of an habituation procedure in the latter study). I think that's unlikely, because the changes in procedure were not very large, but I am in the process of running a group of 8-10 month olds in the modified procedure, just to be sure.

A second possibility is that the way in which infants attend to labeled events changes between 10 and 13 months and that those changes may be related to the vocabulary growth which may be beginning around that time: The tendency to focus more selectively on objects in the presence of labeling may either contribute to or result from whatever causes a vocabulary spurt.

There is at least one other possibility which is rather interesting. All of the sentences used for labeling were frames like "thatsa.." "itsa.." etc. It could be that children of this age have already begun to recognize that those frames go with words that are nouns or at least object names. Although most 13-15 month-old children will not be producing anything longer than single-word sentences for awhile, it does not seem unlikely that they could be starting to notice patterns like these in speech, which may then help them to break into the next level of language learning, the acquisition of grammar. This explanation may intersect nicely with some of the "bootstrapping" notions proposed for the acquistion of grammar. I am just about to start a study which will investigate this possibility more directly.

In summary, the results of the two studies discussed here suggest that young infants, both those who are not yet linguistic and those who are just breaking into language, attend to events differently when they are labeled as opposed to when they are not. Moreover, there appear to be changes, between 10 and 13 months in the way in which infants attend to labeled events: 8-10 month-old infants may attend more selectively to aspects of the event which are consistent, when they hear labeling. In contrast, 13-15 month-old infants may attend more selectively to whole objects.

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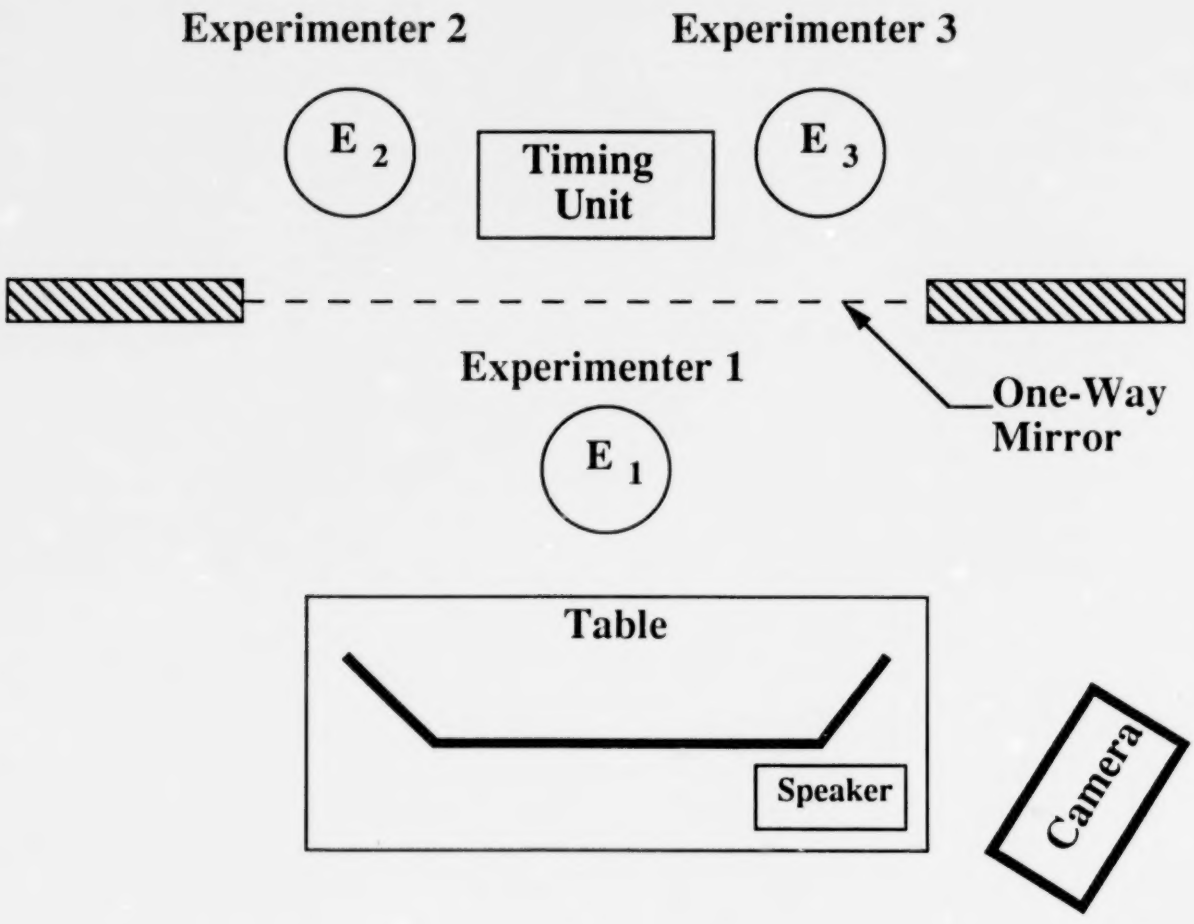
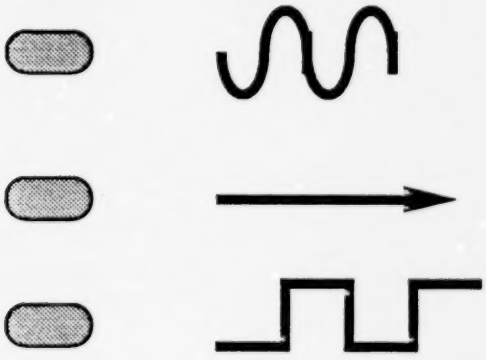
Experimental Setup



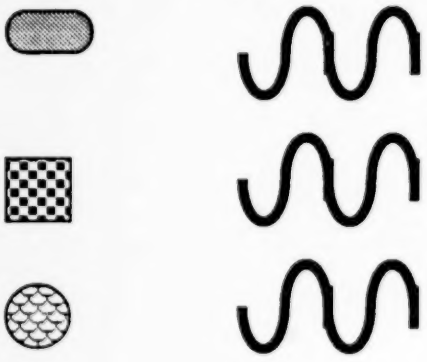
Consistent Object Condition

Object Motion



Consistent Motion Conditon

Object Motion



Dishabituation

Object Motion

Transparency 3

Expected Results

Hypothesis 1: Labeling increases attention to object.

	Proportion Novel Object
Consistent Object	▲
Consistent Motion	▲

Hypothesis 2: Labeling increases attention to consistent element.

	Proportion Novel Object
Consistent Object	▲
Consistent Motion	▼

Transparency 4

Proportion Looking to Novel Object as a Function of Labeling and Condition: 8-10 Month-Old Infants

	Consistent Motion	Consistent Object
Unlabeled	.55	.56
Labeled	.47	.59

Condition $p < .05$
Condition X Labeling $p < .05$

Transparency 5

Expected Results (Relative to younger infants and to unlabeled condition)

Hypothesis A: Similar Pattern

	Proportion Novel Object
Consistent Object	▲▲
Consistent Motion	▼▼

Hypothesis B: Different Pattern (Increased attention to object)

	Proportion Novel Object
Consistent Object	▲
Consistent Motion	▲

Transparency 6

Proportion Looking to Novel Object as a Function of Labeling and Condition: 13-15 Month-Old Infants

	Consistent Motion	Consistent Object
Unlabeled	.50	.52
Labeled	.59	.62

Labeling $p < .02$